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## STRETCHED PEBBLES FROM OCOEE CONGLOMERATE<sup>1</sup>

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The stretched pebbles here described occur in the vicinity of Ellijay, Gilmer County, Georgia, about seventy-five miles north of Atlanta. They are well exposed in a railroad cut on the Louisville & Nashville Railroad a few hundred yards north of the Ellijay station, and are also to be seen at various points both north and south of this place, along the public highway. They seem to be confined chiefly to a narrow belt less than one-half mile wide and about fifteen miles long, lying immediately west and parallel with the Louisville & Nashville Railroad. There are several other points outside of the belt here named where stretched pebbles are occasionally met with, but at no place do they reach such a remarkable stage of elongation. The region in which the conglomerate pebbles occur forms the western margin of the Crystalline rocks of the state. The surface is hilly and rough, but not so mountainous as farther to the east or west. The prevailing rocks of the region are slate, mica-schist, gneiss, marble, and conglomerate, all much folded and contorted. These rocks belong to Safford's Ocoee Series, a group of rocks of great thickness and of unknown age, but apparently older than the Lower Cambrian rocks lying farther to the west.

The beds of stretched pebbles, which at some places are several in number, vary in thickness from eighteen inches to five feet. They are invariably interbedded with mica-schist, and always dip at a steep angle. The beds differ from one another chiefly in the size of the pebbles of which they are formed, and in the extent of elongation of the individual pebbles themselves. In some instances the pebbles have been only slightly flattened or elongated, while in other cases they have been elongated more than twenty times their

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original diameter. The matrix or binding material, which constitutes only a small percentage of the pebble beds, consists mainly of mica. Where the mica is absent or nearly so, the quartz pebbles are frequently found welded together for the greater part of their length; however, a slight pressure is usually sufficient to break the bond without injury to the individuals. Each of the several pebble beds examined consists of two kinds of pebbles, namely quartz

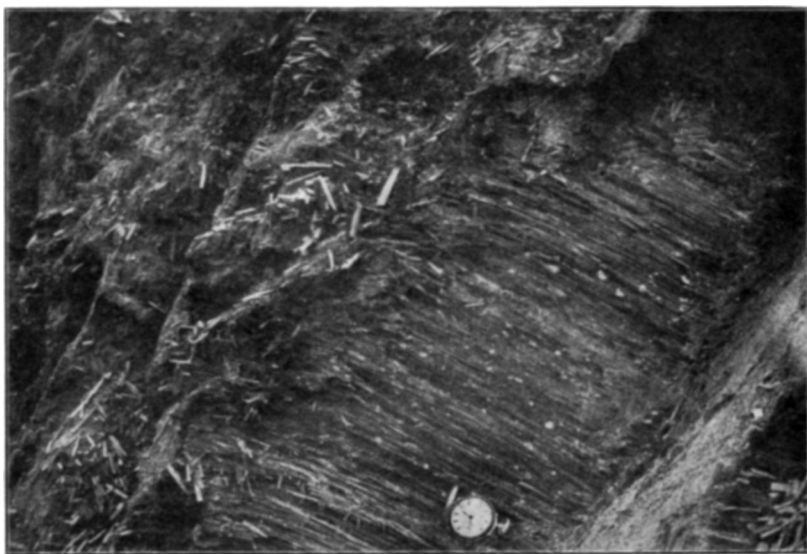


FIG. 1.—Bed of stretched pebbles near Ellijay, Gilmer County, Georgia. White spots show feldspar pebbles not elongated.

pebbles and feldspar pebbles. The former are by far the more abundant and are always greatly elongated. The feldspar pebbles, on the other hand, are never elongated, but still retain in a more or less perfect degree their original rounded shape. The feldspar pebbles, which are partially kaolinized, are well shown in Fig. 1, where they appear as rounded white spots.

The chemical analysis of one of the pebbles by Doctor Edgar Everhart, chemist to the State Geological Survey, here given, shows it to be orthoclase feldspar:

Soluble silica . . . . .	3.59
Insoluble silica . . . . .	59.57
Total silica ( $\text{SiO}_2$ ) . . . . .	63.16
Alumina ( $\text{Al}_2\text{O}_3$ ) . . . . .	21.04
Ferric oxide ( $\text{Fe}_2\text{O}_3$ ) . . . . .	1.02
Lime ( $\text{CaO}$ ) . . . . .	none
Magnesia ( $\text{MgO}$ ) . . . . .	trace
Potash ( $\text{K}_2\text{O}$ ) . . . . .	14.44
Total . . . . .	100.19

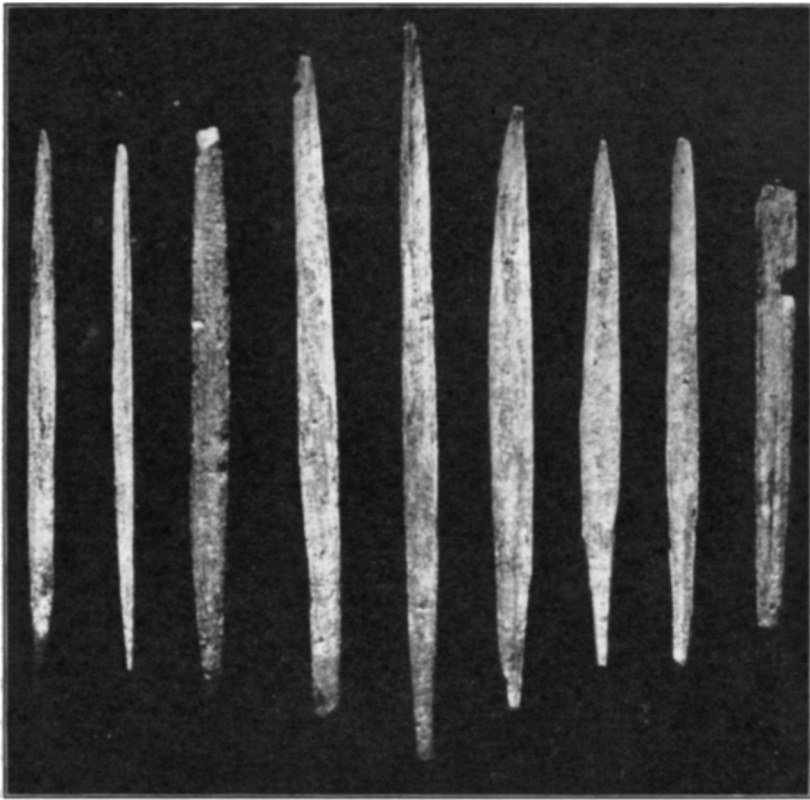


FIG. 2.—Stretched quartz pebbles, three fourths natural size. Pebble at the extreme left has been pierced by a feldspar pebble.

The elongated quartz pebbles are always small, rarely weighing more than a few ounces. Their greatest diameter is generally near the center, from which point they gradually taper to a point at both

ends. In a transverse section they are ellipsoidal, with sharp, knife-like edges. Their sides are often striated, and occasionally indented by depressions, or in some cases even pierced by the feldspar pebbles (see Fig. 2). The color, when unstained by foreign material, is that of milky quartz. The texture is granular, and the larger pebbles are slightly elastic. The latter property seems to be most

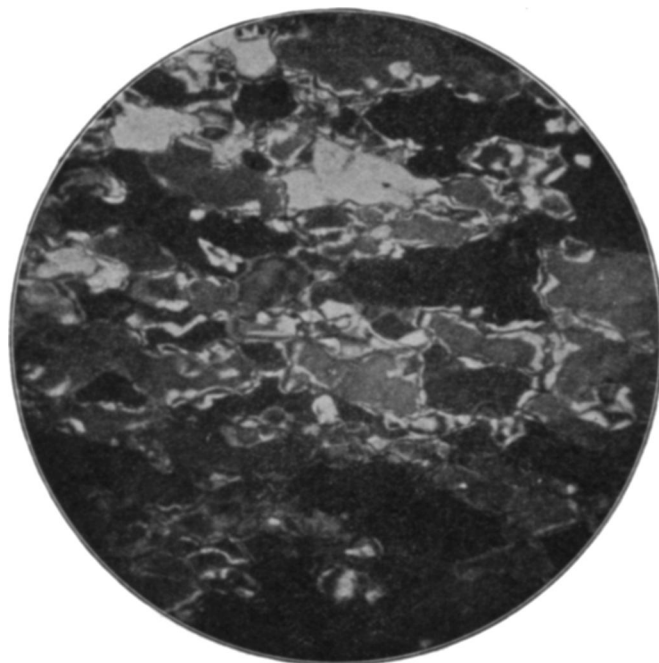


FIG. 3.—Micro-photograph of transverse section of stretched quartz pebble.

pronounced when the pebbles are first taken from the bed. After drying they become somewhat brittle and have to be handled with more care. The individual pebbles appear to have no cleavage, but break as readily in one direction as another. The following analysis by Doctor Edgar Everhart shows that they are almost pure silica:

Soluble silica . . . . .	1.29
Insoluble silica . . . . .	97.84
Total silica ( $\text{SiO}_2$ ) . . . . .	99.13
Ferric oxidee ( $\text{Fe}_2\text{O}_3$ ) . . . . .	0.77
Alumina ( $\text{Al}_2\text{O}_3$ ) . . . . .	0.16
Total . . . . .	100.06

Microscopic examination of thin sections of the pebbles shows that they are made up of interlocking quartz granules containing numerous small inclusions. Some of the granules exhibit a banded appearance somewhat like, but different from, plagioclase feldspar. It has been suggested that these bands are possibly due to striæ made by grinding; but this explanation hardly seems plausible, as such irregular surfaces would probably be rendered invisible by the Canada balsam. In sections tranverse to the long axis of the pebbles the granules are elongated; but in sections parallel to the long axis, and in the short axis of the ellipse formed by the cross-section, as well as in sections parallel to the long axis, and in the long axis of the ellipse formed by the transverse section, the elongation of the granules is not so pronounced. The degree of elongation of the individual granules in the tranverse section is about sufficient to account for the flattening of the pebbles in that direction. The mechanical effect of strain or stress shown by wavy extinction was not observed in any of the sections.